

GLOBE NOTES.

Geography vol. 1.

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OXFORD,
Printed for Henry Clements. 1701.

ST. LOUIS

1857

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NOTES UPON
Both Globes,
Celestial and Terrestrial.

First concerning the Celestial
G L O B E.

IT is the model of Heaven, but chiefly of the Eighth Sphere, wherein three things are to be observed in general, *viz.*

1. Definition.
2. Delineations.
3. Use.

1. The Definition.

It is a Spherical body, having a point or center in the midst, from whence right lines being extended to the superficies they are all equal.

A 2

2. De-

2. Delineations.

which are these Three.

1. *The Lines or Circles.*
2. *The principal Points.*
3. *The Figures or Constellations.*

First of the Lines or Circles, every of which are actually or intellectually divided into 360 equal parts, called Degrees, the more principal whereof are these Ten, which make up the *Sphæra armillaris*, six whereof are great Circles, as be all those which divide the Globe into two equal parts, or Hemispheres, having the same Center with the Globe; And the other Four are called Smaller Circles, because they divide the Globe into two unequal parts or Segments.

The Six great Circles are these.

1. The Horizon is a broad Circle upon the frame, this divideth the Globe into two Hemispheres, the one which we see, is alwaies above the Horizon, the other which we see not, is below: And on the Horizon are drawn divers Circles, *viz* of the 12 Signes and of the days of the Months, and the 32 Winds.

2. The Meridian is the Brass Circle which standeth at right Angles to the Horizon, & in which

which the Globe is hanged and turned about on its Poles, which are the ends or extremities of the Axis of the World, and upon the Meridian, is another little hour Circle fastened, with an index moving about upon the Pole.

3. The Equinoctial is drawn upon the Superficies of the Globe, in the midst between the two Poles of the World, and the degrees thereof are nūbred with 10, 20, 30, &c. to 360.

4. The Ecliptick line, this cutteth the Equinoctial in two points, and is divided into 12 Signes, each containing 30 degrees, and it passeth in the midst of the Zodiac, for the Zodiac is a broad circle containing 16 degrees in bredth, and is the bounder of the 7 Planets.

5. The Equinoctial Colure, this cutteth the Equinoctial at right Angles, in the two points where the Ecliptick passeth over the same Equinoctial Line, and so passeth through the Poles of the World.

6. The Solstitial Colure, this passeth through the Ecliptick where it toucheth both the Tropicks, and cutteth both the Equinoctial and Ecliptick at right Angles, and passeth through the Poles of the World, where also it cutteth the Equinoctial Colure at right Angles.

The Four lesser Circles are,

1. The Two Tropicks, each being parallel to the Equinoctial, and about 23 degrees, & 30^m from

from it. That which is toward the *North Pole*, is called the *Tropick of Cancer*; That which is towards the *South Pole*, is called the *Tropick of Capricorn*, and these are the bounders of the greatest Declination of the Sun.

2. The Two Polar Circles, These are so far distant from the Poles of the World, as the Tropicks are from the Equinoctial; That w^{ch} is next to the *North Pole*, is called the *Artick Polar Circle*, and that which is next the *South Pole*, is called the *Antartick Polar Circle*.

There are moreover drawn upon this Globe divers other great Circles passing by the beginning of the Twelve Signes, cutting each other in Two opposite points, and these with the Solstitial Colure, divide the Globe into 12 equal parts, and these are called the Circles of the Longitude of Stars.

Also through every point of the Meridian there are small Circles imagined to be drawn parallel to the Equinoctial, which are called the parallels of Declination of the Sun & Stars.

Also the like small Circles are imagined to be drawn parallel to the Horizon, and these are called Almicanars, or Circles of Latitude.

The Second thing noted in the Delineation is the Points to be observed in the Globe.

1. **T**He more principal are these, viz. The Two points on which the Globe hang-
ed

ed and turned about within the Brazen Meridian, these represent the Poles of the World, from one of which to the other there passeth a straight Line through the Center of the Globe called the Axis of the World: Where Note, that the Two Poles of the World are the common Sections of all the Meridian Circles.

2. The Two Poles of the Ecliptick, which are the two points in which the Six Circles of Longitude of Stars do cross or cut each other, and is near about 23 Degrees 30 Minutes distant from the Poles of the World.

3. The Points of Zenith and Nadir, the Zenith is that Point in the Heavens which is directly over our Head, and the Nadir is the contrary, directly under our feet, these Two are the Poles of the Horizon, being every where 90 Degrees from it, and in these Two Points do all the Vertical or Azimuthal Circles meet or cut each other.

4. The Points of *East* and *West*, viz. The two points where the Equinoctial cutteth the Horizon; these are also Diametrically opposite, and are the Poles of the Meridian being every where 90 Degrees from it.

5. The Two Equinoctial Points of Aries and Libra, being two points where the Ecliptick cutteth the Equinoctial, and are Diametrically opposite, the former is called the Vernal Equinoctial

quinoctial, because the Sun coming to it, the Spring beginneth; the other is called the Autumnal Equinoctial, because when the Sun cometh to it, the Autumn beginneth.

6. The Two Solstitial points, being also Diametrically opposite, are the two points on the Globe where the Ecliptick toucheth the Two Tropicks and the Ecliptick in the point of Contact, *viz.* in the beginning of Cancer and Capricorn, and these Two are called Solstitial points, because the Sun moving in the Ecliptick, near either of them, which is in *June* and *December*, it causeth the days to stand still a while, without a sensible lengthning or shortning.

Here it is to be noted, that the Horizon and Meridian Circles are said to be immoveable, because they are fixed to the same place; but all other Circles of the Sphere are said to be moveable, because they being drawn upon the Surface of the Globe or Sphere, must needs move about it in the Diurnal motion, yet other men denominate them by the contrary names.

The Third thing Observed in the Delineations, are the Figures drawn upon the Globe.

THere have been 48 Asterismes or Constellations observed of ancient time, and about them in this Globe are described certain Figures, not because there are any such Figures

gures in the Heavens, but are only imagined there to give denomination to the Stars, of the Firmament, and yet not to all the Stars, for they are innumerable, but only to such as are most conspicuous, and whereof use may best be made, as occasion serveth.

There are 12 Constellations of the Zodiack, through which the Zodiack passeth, and these give Denomination to the 12 Signes of the Zodiack, in particular these with their number of Stars.

	of old.	of late.		of old.	of late.
♈	13	21		♈	8 17
♉	33	43		♉	21 16
♊	18	25		♊	32 14
♋	9	15		♋	28 28
♌	27	40		♌	42 41
♍	26	39		♍	34 36

There have been 21 Constellations observ'd on the *North* side of the Ecliptick, which are called the Northern Constellations, whose names and number of Stars here follow.

of old.

The little Bear	7
The great Bear	27
The Dragon	31
Cepheus	11
Bootes	22
The Northern Crown	8
Hercu-	

Hercules	9
The Vulture Cadent	10
The Swan	17
Cassiopeia	13
Perseus	26
Aurige	14
Serpentarius	24
The Serpent	18
The Arrow or Dart	5
The Eagle	9
The Dolphin	10
The lesser Horse	4
Pegasus	20
Andromeda	23
The Northern Triangle	4

There are 15 Constellations on the South-side of the Ecliptick, which are called the Southern Constellations, whose names and number of Stars here follow.

	of old.
The Whale	22
Orion	38
The River Eridanus	34
The Hare	12
The great Dog	18
The lesser Dog	3
The Ship	45
The Goblet	7

The

The Raven	7
The Centaur	37
The Wolf	19
The Altar	7
The Southern Crown	13
The South Fish	12

Besides the number of the Stars noted in the former Constellations, the Modern Astronomers have noted divers others, which were *left in formes* by the Ancients, and put them into their proper Figures; as may be seen in some of the Globes put forth since Noble *Ticho Brahe*, namely, *Johannes Jansonius* his small Globes of the year 1620. And in *Petrus Plantinus* his Globes of the year 1625.

*The New Constellations in North
Latitude, are these.*

Berenices hair	14
The Bee	4
The River Jordan	21
Camelopardalis	18
The River Euphrates	13.

*The New Constellations in South
Latitude, are these.*

The lesser Crabb	4
The Unicorn	22

More

Moreover because the Ancient Astronomers lived all in North Latitude, they could not see the Stars which are near the South Pole, but they have been since discovered by such as have traveled that way, and are put into Constellations, namely these,

The Dove	11
The Southern Triangle	5
The <i>apous Indica</i>	12
The Peacock	17
The Indian	12
The Crane	13
The Towcan	8
The Hydrus	14
The Phenix	14
The Dorado	6
The Sea Swallow	7
The Camelion	8
The Cross call'd <i>Cruxero</i>	6
The Flye	4

Besides the Constellations before named there are some other appearances in the Heavens, namely, the white broad Circle, call'd *Via Lactea*, or the Milkie way : and two large Clouds-observed near the South Pole. The much of the Delineation, or things noted on the outside of the Celestial Globe.

the Third thing to be observed in
General is the use of the Globe.

Which consisteth in these three things follow-
ing. *viz.* The knowledge of the

1. *Motions.*

2. *Divisions.*

And Operation on the

3. *Propositions.*

1. In the first place of *Motions*, which are
Two in number, *viz.*

1. The *Diurnal* Motion.

2. The *Proper* Motion.

First concerning Motions.

1. The *Diurnal* motion is made upon the
Poles of the World, once about from East to-
ward the West in 24 hours, and this is also
called *motus raptus*, or the motion of the *primum mobile*.

2. The Second motion is called the *annual*
motion, and is made within the *primum mobile*
upon the Poles of the *Ecliptick*, according to
the succession of the *Signes*, which is contrary
to that of the *primum mobile*, *viz.* from West
to-

towards East, and this motion is called *Motus secundus*, or *Motus proprius*, because that every Sphere hath a motion proper to it self, as that of the Sun ☉ finisheth once about *secundam seriem signorum* in the space of twelve months which is called the Solar year, also *Venus* ♀ and *Mercurie* ☿, are moved about the same way in the same time, but the *Moon* ☾ is moved about in one month, and the month is of two sorts, for the time wherein the Moon ☾ departeth from any point of the Zodiack and returneth to it again, is called the Periodical Month, or Month of peragrations: But the time wherein the Moon departeth from the Sun ☉, and overtaketh him again, is called the Month of Consecration, or Synodical Month.

Mars ♂ moveth through the Zodiack in about two Solar years, and that time is called the year of Mars ♂.

Jupiter ♃ is moved through the Zodiack in about 12 Solar years, and that time is called the year of Jupiter ♃.

Saturn ♄ in about 30 years runneth through the Zodiack, and that time is called the year of *Saturn* ♄.

3. The fixed Stars, according to *Ptolomeus* move about the Zodiack in 36000 Solar years: But according to the *Alphonsines* in 49000 years.

years ; and according to *Copernicus* in 17000 years : But *Gassendus* hath it 25000 years ; And this time is called the great year, or *Platonical* year.

Secondly concerning the Divisions.

1. First it is called *Sphæra recta*, or a right sphere, because in such position the Equinoctial cutteth the Horizon at right spherical angles. The properties of the Sphere is to have the Poles of the World ly in the Horizon, and the Equinoctial passeth through the Zenith and Nadir ; and in this sphere not only the Equinoctial, but also both the Tropicks, and all other the Equinoctial parallels, are divided into two equal parts by the right Horizon, which causeth the days and nights, at all times of the year, to be equal, viz. 12 hours long between Sun rising and setting without alteration, to those who live under the Equinoctial line.

2. Secondly it is called *Sphæra Obliqua*, whereof there be so many in number as there be degrees, minutes, seconds, &c. in a Quadrant, and it is called oblique, because the Equinoctial cutteth the Horizon with an oblique angle : the properties of this sphere are to have one Pole elevated above the Horizon, and the other as far depressed : Also because in this sphere the Equinoctial is divided equally by the

the

the Horizon, and the parallels of the Equinoctial unequally, therefore the daies, and the nights are equal only twice a year, viz. in the beginning of the Spring, and Autumn, at which times the Sun passeth over the first Point of Aries γ and Libra ϵ , but at all other times of the year, the days and nights are unequal.

3. It is called *Sphæra parallela*, or a parallel Sphere, because the Equinoctial being the same with the Horizon, all the parallels of the Equinoctial are also parallels to the Horizon; In this Sphere, one of the Poles of the World is the Zenith, and the other is the Nadir, and in this Sphere the Sun continueth above the Horizon about half a year together, and again as long under the Horizon, whereby the artificial day and night are each about half a year long.

Thirdly, now follow the propositions wrought by the Globe.

1. To find the Sun's place in the Ecliptick; first find the day of the Month, upon the Horizon, and within upon the limb of the Horizon standeth the degree in which the Sun is, this you may apply to the Ecliptick upon the Globe.

To find the Sun's Declination.

2. First find the Sun's place in the Ecliptick upon the Globe, and bring it to the brazen Meridian

ridian, and there account how many degrees it is distant from the Equinoctial, for the declination of any point in the heavens is its Meridional distance from the Equator.

The declination of any Star upon the Globe, is found by bringing it to the brazen Meridian and accounting as before.

To find the right Ascension of the Sun.

3. Move the degree of the Ecliptick wherein the Sun is, to the Meridian, and note the degree of the Equinoctial which cometh to the Meridian with it, for the Arch of the Equinoctial contained between that point and the first point of Aries γ , is the right ascension, that is to say, it riseth with it in a right Sphere.

The right ascension of a Star is to be accounted as before, if the Star be brought to the Meridian.

Of the Longitude as it is taken on the Celestial Globe.

4. The Longitude of the Sun, is that Arch of the Ecliptick which is contained between the first point of Aries, and that point of the Ecliptick wherein the Sun $\odot$ is; But the Longitude of a Star is that Arch of the Ecliptick which is contained between the first point of Aries, and the Section of the Ecliptick with a great Circle drawn from the Pole of the Ecliptick through the center of the Star, being reckoned

oned according to the succession of the signs.

Which to find.

• Lay one end of the Quadrant of Altitude upon the Pole of the Ecliptick, and the graduated edge thereof, upon the Center of the Star, and so it shall shew in the Ecliptick, the sign and degree of Longitude.

Of the Latitude as it is taken on the Celestial Globe.

5. It is accounted in a great Circle distant from the Ecliptick toward either Pole thereof, therefore the Sun, or any Star being in the Ecliptick, hath no Latitude, but the Moon ☾, or any other Planet being not in the Dragons Head ♀, or Dragons Tail ♂, or other Stars being not in the Ecliptick, are said to have Latitude so many Degrees as they are distant from the Ecliptick toward either Pole thereof.

Which to find.

Lay one end of the Quadrant of Altitude upon the Pole of the Ecliptick, and the graduated edge thereof upon the Center of the Star, then may you see how many Degrees thereof are contained between the Star and the Ecliptick, and that is the Latitude thereof.

But if you want the Quadrant of Altitude then take a pair of Compasses, and setting one point in the Center of the Star, extend the other till in the nearest distance it touches the Ecliptick.

tick, and the Compasses so opened and applied to the Equinoctial, shall shew how many degrees that Latitude is.

Here Note.

That the Declination and right Ascension of the Sun and Stars have respect to the Equinoctial, but their Longitudes and Latitudes have respect to the Ecliptick.

To rectify the Globe according to the Latitude of your place.

6. Elevate the proper Pole so far above the Horizon as the Latitude of the place proposed, by moving the Pole of the Globe so high by the help of the degrees of the Meridian.

But to rectify for the Suns place, is

7. After the former rectification, to bring the Suns place in the Ecliptick, to the Meridian, turning up the Index of the hour wheel to 12 at noon.

And to rectify for the Zenith, is

8. After the first rectification, to fasten the Nut or Screw of the Quadrant of Altitude at the Zenith, that is, so many degrees from the Equinoctial as the Pole is elevated.

To find the Amplitude of the Sun or any Star that riseth and setteth.

9. The Amplitude is the Horizontal distance of rising or setting from the true points of East and West, which to find, rectify the Globe by

the sixth Proposition according to the latitude, and bring the degree of the Sun in the Ecliptick, or Center of the Star to the Horizon, and therein see how many degrees it is from the East to West.

To find what Stars do not set in any Latitude.

10. By the sixth Prop. rectify according to the Latitude, and turning about the Globe mark what Stars pass between the Elevated Pole and the Horizon, for those (if the North Pole be elevated) are contained within the Artick Circle, and cannot set; for the Artick Circle, as heretofore it hath been taken, is drawn upon the North Pole, through the North point of the Horizon.

*To find the time when the Sun or any Star
Riseth or Setteth.*

11. By the seventh Prop. rectify for the Suns place, and move the Degree of the Sun or center of the Star to the East or West part of the Horizon, and then the Index of the Hour Wheel will shew the time.

*To find how the Constellations are scituate
at any time of the Night.*

12. By the Seventh Prop. rectify for the Suns place: and move about the Globe till the Index come to the Hour desired, and there hold the Globe to shew the present scituation of the Constellations.

To

To find the Oblique ascension of the Sun, or any Star that riseth or setteth.

13. By the sixth Prop. rectify for the Latitude, and bring the degrees of the Sun, or center of the Star to the East part of the Horizon and observe the degree of the Equinoctial which riseth with it; for the arch of the Equinoctial contained between the first point of Aries γ , and the point of the Equinoctial so ascending is called the oblique ascension.

To find the Ascensional difference of the Sun $\odot$.

14. By the third Prop. find the right ascension, and again by the thirteenth Prop. find the oblique ascension thereof, and subtract the lesser of them from the greater, and the remain is the difference of Ascension: for the difference of Ascension, is only the difference between the right and oblique Ascensions: where Note that the difference of Ascension is an Arch of the Equinoctial, and is always the time of the Suns rising before 6, and after 6, the time of the year being considered.

Hereby.

15. To get the time of the Suns rising to a Minute of an hour; turn the Ascensional difference into time, allowing 15 *gr.* thereof to every hour, and to every degree 4 minutes of an hour; And if the Sun be in the Northern Signs, the Ascensional difference is the time

of the Suns rising before 6 a clock, if in the Southern, then after 6 a clock.

Again.

16. Having the time of the Suns rising, before or after 6 a clock, you may get the length of the Artificial day (that is, the time of the Suns continuance above the Horizon.) If the Suns declination be North add it to 6, if South subtract it from 6, and so will come forth the Semidiurnal Arch, this doubled giveth the length of the Artificial day; But if the length of the Artificial night be required, then work contrary to that of the day.

*To find the time of the day by having the
Altitude of the Sun.*

17. First by a Quadrant, or some other Instrument find the Altitude of the Sun above the Horizon, and then by the 6, 7 and 8 Prop. rectify the Globe for the Latitude, the Suns place, and the Zenith, and bring the degree of the Ecliptick wherein the Sun is, to agree to the same Altitude upon the edge of the Quadrant of Altitude, and then the Index of the Hour wheel will shew the time of the day.

*To find the Azimuth of the Sun by having
his Altitude.*

18. The Azimuth of the Sun is the distance thereof, accounted in the Horizon from East, West or South; by the 6, 7 and 8 Prop. rectify

fy the Globe, and bring the Suns place in the Ecliptick, to agree to the same Altitude on the graduated edge of the Quadrant of Altitude, and then the Quadrant of Altitude will shew his Azimuth in the Horizon.

To find the Azimuth of the Sun at any time of the Day.

19. By the 6 and 8 Prop. rectify the Globe, and turn it about till the Index of the Hour wheel do point to the hour given, then lay the Quadrant of Altitude upon the Suns place in the Ecliptick, and it sheweth the Azimuth in the Horizon.

At any time of the year, to find the time of Day break, or beginning of Crepusculum (if any be.)

20. By the 6, 7 and 8 Prop. rectify the Globe and Elevate the opposite degree of the Sun at the West 18 deg. above the Horizon, and then the Index of the hour wheel will shew the time.

Having the Altitude of any known Star, to find the hour of the night.

21. By the 6, 7 and 8 Prop. rectify the Globe and move about the Globe till the Star hath the given Altitude in the graduated edge of the Quadrant of Altitude, and then will the index of the hour wheel shew the hour required.

Having any known Star at the Meridian to find the Hour.

22. By the 6 and 7 Prop. rectify the Globe
B 4 and

and turn the Globe till the same Star comes to the Brasen Meridian, so will the Index of the hour wheel shew the hour.

Of the Poetical Rising and Setting of Stars.

C O S M I C A L.

A Star Riseth Cosmical when it riseth with the Sun, and Setteth Cosmical, if it set when the Sun riseth.

To find the time of the year when a Star riseth Cosmical.

23. By the 6 Prop. rectify, and bring the Star to the East part of the Horizon, and observe the degree of the Ecliptick which is at the East part of the Horizon with it, and then find in the Circle of the Horizon what day of the Month answereth to the same degree of the Ecliptick.

To find the time of the year when a Star Setteth Cosmical.

24. By the 6 Prop. rectify and bring the Star to the West part of the Horizon, and Note the degree of the Ecliptick at the East part of the Horizon, and find the day of the Month on the Horizon as before.

A C R O N I C A L.

A Star Riseth Acronical, when it riseth in the East, and the Sun is setting in the West; And it setteth Acronical, when it Setteth with the Sun.

To find the time of the year when a Star

Riseth Cronical.

25. By the sixt Prop. rectify, and bring the Star to the East part of the Horizon, and Note the degree of the Ecliptick cut by the Horizon at the West, and find the day of the Month answering thereunto upon the Horizon as before.

To find the time of the year when a Star

Setteth Acronical.

26. By the 6 Prop. rectify, and bring the Star to the West part of the Horizon, and Note the degree of the Ecliptick cut by the Horizon at the West, and find the day of the Month upon the Horizon as before.

Heliacal.

Heliacal Rising of a Star, is the rising of a Star out of the Sun beams, for then it appeareth before the Sun rising, though before it could not be seen by reason of its nearness to the Sun, being within the Arch of Vision.

Heliacal Setting is when a Star cometh within the Sun beams, or when a Star is entring into its Arch of Vision, and then cannot be seen setting after the Sun by reason of its nearness to the Sun.

The Arch of Vision is the Arch of a Vertical Circle contained between the Horizon and the center of the Sun after it is set, or before it riseth, this altereth according to the several magnitudes

nitudes of the Stars, for the greater the Star is, the less is the Arch of Vision, and contrary.

The Arches of Vision belonging to the Stars according to their several Magnitudes, are these.

To the First	12	To the Planets.
Second	13	Venus
Third	14	Mercury
Fourth	15	Saturn
Fifth	16	Jupiter
Sixth	17	Mars
Least	18	Moon uncertain.

To find the time of the year when a Star Riseth Heliacal.

27. By the 6 Prop. rectify, and bring the Star to the East part of the Horizon, and Note the degree of the Ecliptick elevated above the West part of the Horizon according to the Arch of Vision appertaining to the same Star and then as before, find the day of the Month on the Limb of the Horizon, answering to the opposite degree of the Ecliptick so elevated at West as aforesaid.

To find the time of the year when a Star Setteth Heliacal.

28. By the 6 Prop. rectify, and bring the Star to the West part of the Horizon, & Note the degree of the Ecliptick elevated at the East part

Star of the Horizon, according to the Arch of
 on belonging to the same Star, and by the
 opposite of it, find the day of the Month on
 the Limb of the Horizon as before.

Description of the Terrestrial GLOBE.

This is a round or spherical body, represent-
 ing the form of the earth and waters.

On this Globe are also described the ten
 great Circles of the *sphæra armillaris*, viz. the *Horizon*,
Midian, *Equator*, *Ecliptick*, the two Colures
 and the four lesser Circles, viz. the two
 Tropicks, and the two Polar Circles.

Besides these common Circles there are de-
 scribed upon this Globe divers other Circles
 passing through both Poles of the world, these
 are called Meridians or Circles of Longitude;
 certain other Circles parallel to the Equi-
 torial, called circles or parallels of Latitude;
 certain oblique circular lines passing
 through the center of certain Roses (so called)
 these are called Rhombs, Courses, or points
 of the compass.

On this Globe are described the known
 parts of the World divided into several quar-
 ters, *Europe*, *Asia*, *Africa*, and *America*, to
 which is added the unknown land about the
 South

South Pole called *Magelanica*. And these quarters of the World are subdivided into several Kingdoms and Provinces, as may be seen in *Geographers*.

The ZONES.

This Globe is also divided into five Zones. The first one is called the Torrid or burnt Zone, & lieth between the Tropicks, the inhabitants hereof are call'd *Amphiscii*, because they have two contrary meridional shadows in a year.

Two are called temperate, and these lieth between the Tropicks and the Polar circles. The inhabitants hereof are called *Heteroscii*, because they have their Meridional shadow one way all the year.

The two frigid Zones, are comprehended within the Polar circles; The inhabitants whereof are called *Periscii* because their shadow at some time of the year goeth round about them.

The Inhabitants of the Terrestrial Globe, do also receive other names relating to their positions each to others.

The *Antipodes* are such as dwell diametrically opposite each to other, and have things contrary, as seasons of the year, and times of the day.

The *Antæci* are such as dwell so far removed from the Equinoctial on one side, as the other dwell

leth on the other side, both under the Meridian.

These have some things common, and some proper; the common, as to have their Zones together: Proper as that the winter of the one, is the others Summer time, the longest day of the one, is the shortest of the other.

The *Periæci* are such as live in the same parallel of Latitude toward the same Pole, and directly opposite each to other, both have the same Meridian, These have their Summers, Winters, and increase, and shortness of days and nights together, but the longest of the one is the day of the other.

Parallels of the longest day.

Besides the Parallels of Latitude formerly mentioned, there are other Parallels imagined to be drawn upon this Globe, which are called Parallels of the longest day: The first of these is to be drawn at that distance from the Equinoctial, where the longest day of the year is $\frac{1}{4}$ hours long: The second where the longest day of the year is $12\frac{1}{2}$ hours long: The third where the longest day of the year is 24 hours long, &c. through places increased their longest day by $\frac{1}{4}$ of an hour, till you come to the Parallel where the longest day of the year is 24 hours long, which is under the

the Longitude of the same place; for Longitude is but the remotion of a place from the first Meridian which passeth through Azores accounting Eastwardly.

To find the distance between two places.

Put the center of the quadrant of altitude on one of the places, and the graduated edge upon the other, and the degrees interjacent shew their distance in degrees, and these may be turned into Miles by multiplying by 69.

To find how one place beareth or lyeth from another.

Elevate the Pole according to the Latitude of the place where you are, and fasten the quadrant of altitude at the Zenith, then bring the place where you are to the Zenith, and move the graduated edge of the quadrant of altitude to the other place, and then the end of the quadrant of altitude will fall upon the Horizon in the point of bearing.

To find what hour of the day or night it is at any place on the Terrestrial Globe.

Bring the place where you are to the Meridian, and turn the Index of the hour wheel to the hour it is with you at present, then turn the other place to the Brazen Meridian, & the Index of the hour wheel will shew the hour desired.

To find by the Terrestrial Globe the quantity of the longest day at any place assigned.

Elevate the Pole of the Globe according to the Latitude of the place.

for the Polar circles; these being drawn each way from the Equinoctial towards each Pole, divide the Globe into unequal parts or spaces, for though they be equal time, yet they agree not in equal distance of place, but are greater or broader near to the Equinoctial, and are narrower the farther they are from it.

CLIMATS.

A Climate containeth two of the parallels of the longest day, and altereth the longest day by the space of half an hour, beginning at the Equinoctial, and are in all 24, which end under the Polar circles; but the Ancients for want of knowledge of the parts under the Equinoctial made at first but seven Climates, and called them by names, but afterwards were added two more, which made up their number to be nine. And these of the Ancients began to be accounted at 12 and 15 from the Equator.

Propositions on the Terrestrial GLOBE.

To find the Latitude of any place set thereon.

Bring the place to the brazen Meridian, and herein account how many degrees are betwixt the Equinoctial and the place, for that is the Latitude you seek; for the latitude is but the re-
motion of the Zenith of a place frō the equator.

To find the Longitude of a place set thereon.

Bring the place under the brazen meridian, and then the meridian will cut the Equinoctial
in

the Latitude of the place given, and bring the Solstitial point of Cancer (if the North Pole be Elevated) to the Meridian, and turn the Index of the hour Wheel to 12 at noon, then if you put the Solstitial point of Cancer to the West part of the Horizon, the Index on the hour Wheel sheweth the time of Sun setting there, and that is also the Semidiurnal Arch, and being doubled giveth the length of the day, it exceed not 24 hours, which end under the Polar Circle.

But if the place assigned be within the Polar Circle, then elevate the Pole of the Globe according to the Latitude of the Place, and turn the Globe till some point of the Vernal Signes in the Ecliptick touch the North point of the Horizon, and note how many degrees of the Ecliptick are from the Solstitial point of Cancer, for that number doubled giveth nearly the length of the day, in our common days, and these days may be turned into weeks and months, &c.

F I N I S.

T H E
Analemma QUADRANT,
serving for all LATITUDES.

By R. HOLLAND.

THE Semidiameter AE is the Equator, and the lines Parallel thereto are Parallels of Declination. The Arches that cross them are hour-lines, meeting in the pole of the world.

To find the Sun's Declination, and Parallel of the day.

Find in the Scale of Months the present day, against it in the middle prickt line is the Declination, which if 'tis in the $\left\{ \begin{array}{l} \text{left} \\ \text{right} \end{array} \right\}$ hand half

of that line, shews 'tis $\left\{ \begin{array}{l} \text{Summer.} \\ \text{Winter.} \end{array} \right\}$ Then count from the Equator so many Parallels as are your degrees of Declination, so you have the Parallel for the day.

To draw two Horizons, and to mark the Summer point.

Find the degree of your Latitude in the
C limb

limb, to it a line drawn from the center A is the winter Horizon. Find also your degree of Latitude in the Radius A P, to it from E the end of the limb a line drawn, is your Summer Horizon. If your Latitude is less than 45° , you must find it among the small figures on the limb, for a line drawn from E through it, is the Summer Horizon. (Your two Horizons may be drawn with a Pencil, so they are easily rubb'd out, when you shift Latitudes.) Then reckon from E toward A your Latitude, so mark your Summer point in the Radius, as is here done at $51^\circ \frac{1}{4}$ from E, suitable to *Oxford* Latitude; also at the same degree of the limb, and Radius A P, is drawn the winter Horizon mark'd W H, and Summer S H.

To find the Sun's Amplitude, and time of rising
and setting, and length of the day and night.

Note where the Parallel of the day crosses the winter Horizon, there is the hour of rising and setting. The hour of Sun { setting }
{ rising } doubt

led gives the length of the $\left\{ \begin{array}{l} \text{day} \\ \text{night.} \end{array} \right\}$ Then fe
one foot of your Compass in the center, and o
pen the other to the point where the Parallel o
the day crosses the winter Horizon, this open
ing

ing set from A toward E, so you will find the Amplitude.

To find the hour of the day in Winter.

Take the Suns hight as by other Quadrants, then setting one foot of your Compass in the center A, open the other to the degree of Altitude found in A E, then run one foot of your Compass toward E, along in the winter Horizon, carrying the other parallel to it till it meets with the Parallel of the day, for there is the hour required.

To find the hour of the day in the Summer $\frac{1}{2}$ year.

Find the Suns Altitude, then set one foot of your Compass in the summer point, and open the other to the deg. of Altitude found in A E; with this opening run one foot along in the Summer Horizon, (and if the degree of Altitude were betwixt the Summer point and A, E

turn the other on the {center
limb } side) and carry it parallel to the Horizon, till it meets with the Parallel for the day, for there is the hour.

Note if the time be before morning 6, or after evening 6, you must use the winter Horizon, and the same process as you do in winter.

To find the beginning of morning, and end of evening Twilight.

Use the Horizon of the contrary time of the year,

year, and supposing the Sun's Altitude 18° , proceed therewith to find the hour as before.

EXAMPLES.

In Lat. $51^{\circ}\frac{3}{4}$, of *Oxford*. *Novem.* 16. the Sun's Declination South is 21° . Amplitude South 36° . Rising at 4 min. before 8 a clock; setting at 4 min. after 4. Then if the Sun's Altitude is found 8° . the hour will be 8 min. past 9 a clock in the morning; or 8 min. before 3 a clock in afternoon.

In the same *Oxford* Lat. *Apr.* the 18. the Sun's Declination is North 14° . Day break at 11 min. past 2. Rising at a quarter before 5; setting at a quarter after 7. Its North Amplitude $23^{\circ}\frac{1}{2}$. Then if the Sun's Altitude is 37° , the time is 7 min. before 9 a clock in morning, or 7 min. after 3 in afternoon.

In Lat. 18° North, as at *Jamaica*. *May* 7, the Sun's Declination is North $19^{\circ}\frac{1}{2}$. Amplitude $20^{\circ}\frac{1}{2}$. Rising at 32 min. after 5. Also there when the Sun is 51° high, the hour is $\frac{1}{4}$ after 9 in morning, or $\frac{1}{4}$ before 3 in afternoon.

Thus also you may find, that in the Latitude of no degrees, or under the Equator, the Sun rises at 6, and sets at six all the year. In the Latitude of $66\frac{1}{2}$, they have no Sun setting in their Summer Solstice, nor Sun rising in their Winter Solstice.

In Latitude 71° North. *Aug.* 10. the Sun's
De-

Declination being $12^{\circ}\frac{1}{2}$ North, its Amplitude is $39\frac{1}{4}$. Rising at 20 min. before 4. Also *May 18th*, the Sun, will not set at all, but continue all day till *July 18th*.

His Altimetrick QUADRANT,
serving to take Hights by Inspection.

That Semi-diameter which passes through the beginning of the limb I call the Initial Radius, the other is the sight Radius. The Parallels to the Initial Radius I call ground lines, the others cross them I call upright lines.

To find an accessible height.

Measure the number of feet between your station, and the perpendicular foot of the object, then look through the sights to the top of the object: Then turn up the Quadrant, so as the plummet may keep the string stretcht where it fell: On the initial Radius find the number of yards in your distance, from that point trace along the upright line till it meets with the string, then follow the ground line to the sight Radius, for there is the number of yards in the height above your eye; to which adding the height of your eye, you have the height of the object above the ground.

Exam-

Example. *The distance being 49 yards, and the string falling on 57 of the limb: the height above your eye is 75½ yards.*

To measure an inaccessible height.

Chuse two Stations both in even ground, and in a right line with the foot of the object, at each Station look through the sights to the top of the object: Measure the yards between the Stations, then lay the 2 strings on the places of the limb where the Plummets fell at the 2 Stations (now the Plummets will serve to stretch one string, as your finger may the other :) Then among the ground lines count with a Pin which of them has so many parts between the 2 strings as you found yards betwixt the Stations, for where this line cuts the sight Radius is the number of yards in the height above your eye.

Note that the distance betwixt the Stations ought to be so much as to make the Plummets fall at the second Station, some degrees different from what it did at the first.

Example. *The string at the nearer Station falling on 51°, at the farther on 24°, and the distance betwixt the Stations being 37 yards the height above your eye will be 58½ yards.*

Three Geographical Definitions.

Def. 1. *A Parallel Sphere is that Position of the Globe, which hath these three Properties, viz. 1. The Poles in the Zenith and Nadir: 2. The Equator in the Horizon: 3. The Parallel Circles parallel to the Horizon.*

The Inhabitants of this Sphere, are those (if any) who live under the two Poles.

Def. 2. *A Right Sphere is that Position of the Globe, which hath these three Properties, viz. 1. Both the Poles in the Horizon. 2. The Equator passing through the Zenith and Nadir. 3. The Parallel Circles perpendicular to the Horizon.*

The Inhabitants of this Sphere, are they who live under the Equinoctial Line.

Def. 3. *An Oblique Sphere is that Position of the Globe, which hath these three Properties, viz. 1. One of the Poles above, and partly under the Horizon. 2. The Equator partly above, and partly under the Horizon. 3. The Parallel Circles cutting the Horizon obliquely.*

The Inhabitants of this Sphere are they, who live on all Parts of the Globe of the Earth, except these exactly under the Poles and Equinoctial Line.

A Cata-

*A Catalogue of Instruments, Made and
Sold by John Prujean, near New-Col-
lege, in Oxford. With Notes of
Use of them.*

Holland's Universal Quadrant.
*His Altimetrick Quadrant, serving to take
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Oughtred's Quadrant.
His double Horizontal Dial.
Gunter's Quadrant.
His Analemma.
His Nocturnal.
Collins's Quadrant.
*Mr. Halton's Universal Quadrant for all
Latitudes, with Mr. Haley's Notes.*
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Napier's Rods.
Mr. Caswel's Nocturnal.
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Mr. Tomson's Pantometron.
Mr. Pound's Cylinder-Dial.
Mr. Edward's Astrolabe.
Mr. Hooper's Dialing Scales.
Scales for Fortification.
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